

WHAT IS CLAIMED IS:

- 1 1. An apparatus for polishing objects, said apparatus comprising:
2 a first object carrier positioned over a first polishing surface;
3 a second object carrier positioned over a second polishing surface;
4 a first object relay device positioned between said first and second
5 object carriers, said first object relay device including a first load-and-unload cup
6 and a first pivoting drive mechanism, said first pivoting drive mechanism being
7 configured to pivot said first load-and-unload cup to and from said first and
8 second object carriers about a first pivoting axis to transfer said objects from said
9 first object carrier to said second object carrier; and
10 a second object relay device positioned adjacent to one of said first
11 and second object carriers, said second object relay device including a second
12 load-and-unload cup and a second pivoting drive mechanism, said second pivoting
13 mechanism being configured to pivot said second load-and-unload cup to and
14 from one of said first and second object carriers about a second pivoting axis to
15 transfer said objects to said first object carrier or from said second object carrier.
- 1 2. The apparatus of claim 1 wherein said first and second object carriers are
2 arranged in a first linear manner, and parking positions of said first and second
3 load-and-unload cups of said first and second object relay devices are arranged in
4 a second linear manner such that said first and second object carriers are
5 positioned to be substantially parallel to said first and second load-and-unload
6 cups positioned at said parking positions.
- 1 3. The apparatus of claim 2 wherein the distance between said first and
2 second object carriers is substantially equivalent to the distance between said
3 parking positions.
- 1 4. The apparatus of claim 1 further comprising an object cleaner configured
2 to clean said objects, said object cleaner being positioned such that a longer side
3 of said object cleaner is adjacent to a longer side of an area defined by said first
4 and second polishing surfaces.

1 5. The apparatus of claim 1 further comprising a first object transport device
2 to transfer said objects to said first object carrier or said second load-and-unload
3 cup of said second object relay device, and a second object transport device to
4 transfer said objects from said second object carrier or from said second load-and-
5 unload cup.

1 6. The apparatus of claim 1 wherein said second object relay device is
2 positioned adjacent to said first object carrier such that said first object carrier is
3 positioned between said first and second object relay devices, and further
4 comprising a third object relay device positioned adjacent to said second object
5 carrier such that said second object carrier is positioned between said first object
6 relay device and said third object relay device, said third object relay device
7 including a third load-and-unload cup and a third pivoting drive mechanism, said
8 third pivoting mechanism being configured to pivot said third load-and-unload
9 cup to and from said second object carrier about a third pivoting axis to transfer
10 said objects from said second object carrier.

1 7. A method for polishing objects, said method comprising:
2 transferring an object to a first object carrier positioned over a first
3 polishing surface;
4 polishing said object on said first polishing surface using said first
5 object carrier;
6 transferring said object from said first object carrier to a second
7 object carrier positioned over a second polishing surface using a first load-and-
8 unload cup, including pivoting said load-and-unload cup about a pivoting axis;
9 polishing said object on said second polishing surface using said
10 second object carrier; and
11 transferring said object to a second load-and-unload cup positioned
12 adjacent to one of said first and second object carriers to load said object onto said
13 first object carrier or unload said object from said second object carrier.

1 8. The method of claim 7 further comprising transferring said object to said
2 first object carrier or said second load-and-unload cup, and transferring said object
3 from said second load-and-unload cup or from said second object carrier.

1 9. The method of claim 7 further comprising transferring said object from
2 said second object carrier to a third load-and-unload cup positioned adjacent to
3 said second object carrier.

1 10. An apparatus for polishing objects, said apparatus comprising:
2 a plurality of object carriers positioned over a plurality of polishing
3 surfaces; and
4 a plurality of object relay devices positioned between said object
5 carriers such that at least one object relay device is positioned between two
6 adjacent object carriers, each object relay device including a load-and-unload cup
7 and a pivoting drive mechanism, said pivoting drive mechanism being configured
8 to pivot said load-and-unload cup to and from said two adjacent object carriers
9 about a pivoting axis to transfer said objects between said two adjacent object
10 carriers.

1 11. The apparatus of claim 10 wherein said object carriers are arranged in a
2 linear manner.

1 12. The apparatus of claim 11 wherein parking positions of load-and-unload
2 cups of said object relay devices are further arranged in a linear manner such that
3 said object carriers are positioned to be substantially parallel to said load-and-
4 unload cups positioned at said parking positions.

1 13. The apparatus of claim 12 wherein the distance between adjacent object
2 carriers of said object carriers is substantially equivalent to the distance between
3 adjacent parking positions of said parking positions.

1 14. The apparatus of claim 10 wherein parking positions of load-and-unload
2 cups of said object relay devices are arranged in a linear manner.

1 15. The apparatus of claim 10 further comprising a first object transport device
2 to transfer said objects to a first end object carrier of said object carriers, and a
3 second object transport device to transfer said objects from a second end object
4 carrier of said object carriers.

1 16. The apparatus of claim 10 further comprising an additional object relay
2 device positioned to transfer said objects to or from a first end object carrier of
3 said object carriers, said additional object relay device including a load-and-
4 unload cup and a pivoting drive mechanism.

1 17. The apparatus of claim 16 further comprising a first object transport device
2 to transfer said objects to said load-and-unload cup of said additional object relay
3 device, and a second object transport device to transfer said objects from a second
4 end object carrier of said object carriers.

1 18. The apparatus of claim 16 further comprising a first object transport device
2 to transfer said objects to a second end object carrier of said object carriers, and a
3 second object transport device to transfer said objects from said load-and-unload
4 cup of said additional object relay device.

1 19. The apparatus of claim 16 further comprising a second additional object
2 relay device positioned to transfer said objects to a second end object carrier of
3 said object carriers, said second additional object relay device including a load-
4 and-unload cup and a pivoting drive mechanism.

1 20. The apparatus of claim 19 further comprising a first object transport device
2 to transfer said objects to said load-and-unload cup of said additional object relay
3 device, and a second object transport device to transfer said objects from said
4 load-and-unload cup of said second additional object relay device.

1 21. The apparatus of claim 10 wherein said object carriers are arranged such
2 that distances between adjacent object carriers are substantially equivalent.

1 22. The apparatus of claim 10 wherein parking positions of load-and-unload
2 cups of said object relay devices are arranged such that distances between adjacent
3 load-and-unload cups are substantially equivalent when said load-and-unload cups
4 are positioned at said parking positions.

1 23. The apparatus of claim 10 further comprising an object cleaner configured
2 to clean said objects, said object cleaner being positioned such that a longer side
3 of said object cleaner is adjacent to a longer side of an area defined by said
4 polishing surfaces.

1 24. A method for polishing objects, said method comprising:
2 sequentially transferring an object to a plurality of object carriers
3 positioned over a plurality of polishing surfaces using a plurality of load-and-
4 unload cups, including pivoting each of said load-and-unload cups about a
5 pivoting axis to transfer said object between two adjacent object carriers of said
6 object carriers; and
7 sequentially polishing said object on said polishing surfaces using
8 said object carriers.

1 25. The method of claim 24 further comprising transferring said object to a
2 first end object carrier of said object carriers, and transferring said object from a
3 second end object carrier of said object carriers.

1 26. The method of claim 24 further comprising transferring said object to an
2 additional load-and-unload cup positioned adjacent to an end object carrier of said
3 object carriers, and pivoting said additional load-and-unload cup about a second
4 pivoting axis to transfer said object to or from said end object carrier.

1 27. The method of claim 26 further comprising transferring said object to said
2 additional load-and-unload cup, and transferring said object from a second end
3 object carrier of said object carriers.

1 28. The method of claim 26 further comprising transferring said object to a
2 second end object carrier of said object carriers, and transferring said object from
3 said additional load-and-unload cup.

1 29. The method of claim 26 further comprising transferring said object to a
2 second additional load-and-unload cup positioned adjacent to a second end object
3 carrier of said object carriers, and pivoting said second additional load-and-unload
4 cup about a third pivoting axis to transfer said object from said second end object
5 carrier.

1 30. The method of claim 29 further comprising transferring said object to said
2 additional load-and-unload cup, and transferring said object from said second
3 additional load-and-unload cup.

1 31. An apparatus for polishing objects, said apparatus comprising:
2 a first object carrier positioned over a first polishing surface;
3 a second object carrier positioned over a second polishing surface;
4 an object relay device positioned between said first and second
5 object carriers, said object relay device including a load-and-unload cup; and
6 a linear drive mechanism operatively connected to said object relay
7 device, said linear drive mechanism being configured to displace said load-and-
8 unload cup of said object relay device in a substantially linear reciprocating
9 manner to and from said first and second object carriers to transfer said objects
10 from said first object carrier to said second object carrier.

1 32. The apparatus of claim 31 further comprising a first object transport device
2 to transfer said objects to said first object carrier, and a second object transport
3 device to transfer said objects from said second object carrier.

1 33. The apparatus of claim 31 further comprising:
2 a first additional object carrier positioned over said first polishing
3 surface;
4 a second additional object carrier positioned over said second
5 polishing surface; and
6 an additional object relay device positioned between said first and
7 second additional object carriers, said additional object relay device including an
8 additional load-and-unload cup, said additional load-and-unload cup being
9 displaced in a substantially linear reciprocating manner to and from said first and
10 second additional object carriers to transfer said objects from said first additional
11 object carrier to said second additional object carrier.

1 34. The apparatus of claim 33 wherein said additional object relay device is
2 coupled to said object relay device such that said additional load-and-unload cup
3 and said load-and-unload cup are linearly displaced together.

1 35. The apparatus of claim 31 further comprising:
2 a plurality of object carriers positioned over a plurality of polishing
3 surfaces, said plurality of object carriers including said first and second object
4 carriers; and
5 a plurality of object relay devices positioned between said object
6 carriers such that at least one object relay device is positioned between two
7 adjacent object carriers, said object relay devices being operatively connected to
8 said linear drive mechanism to be linearly displaced, each object relay device
9 including a load-and-unload cup, said plurality of object relay devices including
10 said object relay device.

1 36. The apparatus of claim 35 wherein said linear drive mechanism is
2 configured to collectively displace some of said object relay devices in a
3 substantially linear motion.

1 37. The apparatus of claim 35 wherein said linear drive mechanism is
2 configured to individually displace each of said object relay devices in a
3 substantially linear motion.

1 38. The apparatus of claim 35 wherein said object carriers are arranged in a
2 linear manner.

1 39. The apparatus of claim 38 wherein said load-and-unload cups of said
2 object relay devices are further arranged in a linear manner such that said object
3 carriers are positioned to be substantially parallel to said load-and-unload cups.

1 40. The apparatus of claim 39 wherein the distance between adjacent object
2 carriers of said object carriers is substantially equivalent to the distance between
3 load-and-unload cups of adjacent object relay devices.

1 41. The apparatus of claim 35 wherein said load-and-unload cups of said
2 object relay devices are arranged in a linear manner.

1 42. The apparatus of claim 35 further comprising a first object transport device
2 to transfer said objects to a first end object carrier of said object carriers, and a
3 second object transport device to transfer said objects from a second end object
4 carrier of said object carriers.

1 43. The apparatus of claim 35 further comprising an additional object relay
2 device positioned to transfer said objects to or from an end object carrier of said
3 object carriers, said additional object relay device including a load-and-unload
4 cup.

1 44. The apparatus of claim 43 further comprising a first object transport device
2 to transfer said objects to said load-and-unload cup of said additional object relay
3 device, and a second object transport device to transfer said objects from a second
4 end object carrier of said object carriers.

1 45. The apparatus of claim 43 further comprising a first object transport device
2 to transfer said objects to a second end object carrier of said object carriers, and a
3 second object transport device to transfer said objects from said load-and-unload
4 cup of said additional object relay device.

1 46. The apparatus of claim 43 further comprising a second additional object
2 relay device positioned to transfer said objects to a second end object carrier of
3 said object carriers, said second additional object relay device including a load-
4 and-unload cup.

1 47. The apparatus of claim 46 further comprising a first object transport device
2 to transfer said objects to said load-and-unload cup of said additional object relay
3 device, and a second object transport device to transfer said objects from said
4 load-and-unload cup of said second additional object relay device.

1 48. The apparatus of claim 35 wherein said object carriers are arranged such
2 that distances between adjacent object carriers are substantially equivalent.

1 49. The apparatus of claim 35 wherein said load-and-unload cups of said
2 object relay devices are arranged such that distances between adjacent load-and-
3 unload cups are substantially equivalent when said load-and-unload cups are
4 positioned at respective parking positions.

1 50. The apparatus of claim 35 further comprising:
2 a plurality of additional object carriers positioned over said
3 plurality of polishing surfaces such that at least one of said object carriers and at
4 least one of said additional object carriers are positioned over each of said
5 polishing surfaces; and
6 a plurality of additional object relay devices positioned between
7 said additional object carriers such that at least one additional object relay device
8 is positioned between two adjacent additional object carriers, each of said
9 additional object relay devices including an additional load-and-unload cup, each
10 additional load-and-unload cup of said additional object relay devices being
11 displaced in a substantially linear reciprocating manner to transfer said objects
12 between two adjacent additional object carriers.

1 51. The apparatus of claim 50 wherein at least one of said additional object
2 relay devices is coupled to at least one of said object relay devices such that said
3 additional load-and-unload cup of said at least one of said additional object relay
4 devices and said load-and-unload cup of said at least one of said object relay
5 devices are linearly displaced together.

1 52. The apparatus of claim 31 further comprising an object cleaner configured
2 to clean said objects, said object cleaner being positioned such that a longer side
3 of said object cleaner is adjacent to a longer side of an area defined by said first
4 and second polishing surfaces.

1 53. A method for polishing objects, said method comprising:
2 transferring an object to a first object carrier positioned over a first
3 polishing surface;
4 polishing said object on said first polishing surface using said first
5 object carrier;
6 transferring said object from said first object carrier to a second
7 object carrier positioned over a second polishing surface using a load-and-unload
8 cup, including linearly displacing said load-and-unload cup from said first object
9 carrier to said second object carrier; and
10 polishing said object on said second polishing surface using said
11 second object carrier.

1 54. The method of claim 53 further comprising transferring said object to said
2 first object carrier using a first object transport device, and transferring said object
3 from said second object carrier using a second object transport device.

1 55. The method of claim 53 further comprising:
2 transferring a second object to a first additional object carrier
3 positioned over said first polishing surface;
4 polishing said second object on said first polishing surface using
5 said first additional object carrier;
6 transferring said second object from said first additional object
7 carrier to a second additional object carrier positioned over said second polishing
8 surface using an additional load-and-unload cup, including linearly displacing said
9 additional load-and-unload cup from said first additional object carrier to said
10 second additional object carrier; and
11 polishing said second object on said second polishing surface using
12 said second additional object carrier.

1 56. The method of claim 55 wherein said transferring said object from said
2 first object carrier to said second object carrier and said transferring said second
3 object from said first additional object carrier to said second additional object
4 carrier include linearly displacing said load-and-unload cup and said additional
5 load-and-unload cup together.

1 57. The method of claim 53 wherein said first and second object carriers are
2 part of a plurality of object carriers positioned over a plurality of polishing
3 surfaces, and wherein said load-and-unload cup is part of a plurality of load-and-
4 unload cups that can be positioned between said object carriers such that at least
5 one load-and-unload cup is positioned between two adjacent object carriers.

1 58. The method of claim 57 wherein said linearly displacing said load-and-
2 unload cup includes collectively displacing some of said load-and-unload cups in
3 a substantially linear motion.

1 59. The method of claim 57 wherein said linearly displacing said load-and-
2 unload cup includes individually displacing said load-and-unload cups in a
3 substantially linear motion.

1 60. The method of claim 57 further comprising transferring said object to a
2 first object transport device positioned adjacent to a first end object carrier of said
3 object carriers, and transferring said object to a second object transport device
4 positioned adjacent to a second end object carrier of said object carriers.

1 61. The method of claim 57 further comprising transferring said object to an
2 additional load-and-unload cup positioned to adjacent to an end object carrier of
3 said object carriers, and transferring said object to or from said end object carrier
4 using said additional load-and-unload cup.

1 62. The method of claim 61 further comprising transferring said object to said
2 additional load-and-unload cup using a first object transport device, and
3 transferring said object from a second end object carrier of said object carriers
4 using a second object transport device.

1 63. The method of claim 61 further comprising transferring said object to a
2 second end object carrier of said object carriers using a first object transport
3 device, and transferring said object from said additional load-and-unload cup
4 using a second object transport device.

1 64. The method of claim 61 further comprising transferring said object to a
2 second additional load-and-unload cup positioned adjacent to a second end object
3 carrier of said object carriers, and transferring said object from said second end
4 object carrier using said second additional load-and-unload cup.

1 65. The method of claim 64 further comprising transferring said object to said
2 additional load-and-unload cup using a first object transport device, and
3 transferring said object from said second additional load-and-unload cup using a
4 second object transport device.

1 66. The method of claim 57 further comprising:
2 sequentially transferring a second object to a plurality of additional
3 object carriers, said additional object carriers being positioned over said plurality
4 of polishing surfaces such that at least one of said object carriers and at least one
5 of said additional object carriers are positioned over each of said polishing
6 surfaces;
7 sequentially polishing said second object on said polishing surfaces
8 using said additional object carriers;
9 transferring said second object between said additional object
10 carriers using a plurality of additional load-and-unload cups, including linearly
11 displacing said additional load-and-unload cups between said additional object
12 carriers.

1 67. The method of claim 66 wherein said transferring said second object
2 between said additional object carriers includes linearly displacing at least one of
3 said additional load-and-unload cups and at least one of said load-and-unload cups
4 together.

1 68. An apparatus for polishing objects, said apparatus comprising:
2 an object polishing station having an input region to receive said
3 objects and an output region to output said objects, said object polishing station
4 including:
5 a plurality of polishing surfaces;
6 an object transfer station positioned between two adjacent
7 polishing surfaces of said polishing surfaces;
8 a plurality of object carriers, each of said object carriers
9 being configured to secure one of said objects; and
10 at least one drive mechanism operatively connected to at
11 least one of said object carriers, said drive mechanism being configured to
12 displace at least one of said object carriers to and from said object transfer station
13 and one of said two adjacent polishing surfaces; and
14 at least one object transport device to transfer said objects to said
15 input region of said object polishing station and to transfer said objects from said
16 output region of said object polishing station,
17 wherein each of said objects is transferred from said input region to
18 said output region by way of said polishing surfaces of said object polishing
19 station such that each of said objects is polished on said polishing surfaces.

1 69. The apparatus of claim 68 wherein said at least one object transport device
2 is configured to transfer said objects directly to a first end object carrier of said
3 object carriers of said object polishing station, said at least one object transport
4 device being further configured to transfer said objects directly from a second end
5 object carrier of said object carriers.

1 70. The apparatus of claim 68 wherein said drive mechanism of said object
2 polishing station is configured to collectively displace some of said object carriers
3 in a substantially linear motion.

1 71. The apparatus of claim 68 wherein said drive mechanism of said object
2 polishing station is configured to individually displace each of said object carriers
3 in a substantially linear motion.

1 72. The apparatus of claim 68 wherein said object polishing station further
2 comprises a plurality of drive mechanisms, said drive mechanisms including said
3 drive mechanism, each of said drive mechanisms being configured to individually
4 displace each of said object carriers in a pivoting motion.

1 73. The apparatus of claim 68 wherein said object carriers of said object
2 polishing station are arranged in a linear manner.

1 74. The apparatus of claim 73 wherein said object polishing station further
2 comprises a plurality of object transfer stations positioned between said polishing
3 surfaces such that at least one object transfer station is positioned between two
4 adjacent polishing surfaces, said plurality of object transfer stations including said
5 object transfer station, said object transfer stations being arranged in a linear
6 manner such that said object transfer stations are positioned substantially parallel
7 to said object carriers.

1 75. The apparatus of claim 74 wherein the distance between adjacent object
2 carriers of said object polishing station is substantially equivalent to the distance
3 between adjacent object transfer stations of said object polishing station.

1 76. The apparatus of claim 68 wherein said object polishing station further
2 comprises a plurality of object transfer stations positioned between said polishing
3 surfaces such that at least one object transfer station is positioned between two
4 adjacent polishing surfaces, said plurality of object transfer stations including said
5 object transfer station, said object transfer stations being arranged in a linear
6 manner.

1 77. The apparatus of claim 68 wherein said object polishing station comprises
2 an additional object transfer station positioned to transfer said objects to or from
3 an end object carrier of said object carriers.

1 78. The apparatus of claim 77 wherein said at least one transport device is
2 configured to transfer said objects to said additional object transfer station of said
3 object polishing station, said at least one object transport device being further
4 configured to transfer said objects from a second end object carrier of said object
5 carriers.

1 79. The apparatus of claim 78 said at least one object transport device is
2 configured to transfer said objects to a second end object carrier of said object
3 carriers, said at least one object transport device being further configured to
4 transfer said objects from said additional object transfer station.

1 80. The apparatus of claim 77 wherein said object polishing station further
2 comprising a second additional object transfer station positioned to transfer said
3 objects to a second end object carrier of said object carriers.

1 81. The apparatus of claim 80 wherein said at least one object transport device
2 is configured to transfer said objects to said additional object transfer station, said
3 at least one object transport device being further configured to transfer said
4 objects from said second additional object transfer station.

1 82. The apparatus of claim 68 wherein said object carriers of said object
2 polishing station are arranged such that distances between adjacent object carriers
3 are substantially equivalent.

1 83. The apparatus of claim 68 wherein said object polishing station further
2 comprises:
3 a plurality of additional object transfer stations positioned between
4 said polishing surfaces such that at least one of said additional object transfer
5 stations is positioned between two adjacent polishing surfaces; and
6 a plurality of additional object carriers, each of said additional
7 object carriers being displaced in a substantially linear reciprocating manner to
8 transfer said objects between one of said additional object transfer stations and
9 one of said polishing surfaces.

1 84. The apparatus of claim 83 wherein at least one of said additional object
2 carriers is coupled to at least one of said object carriers such that said at least one
3 of said additional object carriers and said at least one of said object carriers are
4 displaced together.

1 85. The apparatus of claim 68 further comprising an object cleaner configured
2 to clean said objects, said object cleaner being positioned such that a longer side
3 of said object cleaner is adjacent to a longer side of an area defined by said
4 polishing surfaces.

1 86. A method for polishing objects, said method comprising:
2 receiving an object at an input region of an object polishing station;
3 sequentially transferring said object to a plurality of polishing
4 surfaces of said object polishing station using a plurality of object carriers of said
5 object polishing station;
6 sequentially polishing said object on said polishing surfaces using
7 said object carriers;
8 transferring said object to an object transfer station of said object
9 polishing station from a first adjacent polishing surface of said polishing surfaces
10 using a first object carrier of said object carriers;
11 transferring said object from said object transfer station to a second
12 adjacent polishing surface of said polishing surfaces using a second object carrier
13 of said object carriers; and
14 outputting said object from an output region of said object
15 polishing station after said object has been polished on said polishing surfaces.

1 87. The method of claim 86 wherein said receiving includes transferring said
2 object directly to a first end object carrier of said object carriers, and wherein said
3 outputting includes transferring said object directly from a second end object
4 carrier of said object carriers.

1 88. The method of claim 86 wherein said transferring said object to said object
2 transfer station and said transferring said object from said object transfer station
3 include collectively displacing said first and second object carriers in a
4 substantially linear motion.

1 89. The method of claim 86 wherein said transferring said object to said object
2 transfer station and said transferring said object from said object transfer station
3 include individually displacing said first and second object carriers in a
4 substantially linear motion.

1 90. The method of claim 86 wherein said transferring said object to said object
2 transfer station and said transferring said object from said object transfer station
3 include individually displacing each of said first and second object carriers in a
4 pivoting motion.

1 91. The method of claim 86 further comprising transferring said object to an
2 additional object transfer station of said object polishing station positioned
3 adjacent to an end object carrier of said object carriers such that said end object
4 carrier can transfer said object to or from said additional object transfer station.

1 92. The method of claim 91 wherein said receiving includes transferring said
2 object directly to said additional object transfer station, and wherein said
3 outputting includes transferring said object directly from a second end object
4 carrier of said object carriers.

1 93. The method of claim 91 wherein said receiving includes transferring said
2 object directly to a second end object carrier of said object carriers, and wherein
3 said outputting includes transferring said object directly from said additional
4 object transfer station.

1 94. The method of claim 91 further comprising transferring said object to a
2 second additional object transfer station of said object polishing station positioned
3 adjacent to a second end object carrier of said object carriers such that said second
4 object carrier can transfer said object to said second additional object transfer
5 station.

1 95. The method of claim 94 wherein said receiving includes transferring said
2 object directly to said additional object transfer station, and wherein said
3 outputting includes transferring said object directly from said second additional
4 object transfer station.

1 96. The method of claim 86 further comprising:
2 sequentially transferring a second object to said polishing surfaces
3 using a plurality of additional object carriers of said object polishing station;
4 sequentially polishing said second object on said polishing surfaces
5 using said additional object carriers;
6 transferring said second object to an additional object transfer
7 station of said object polishing station from said first adjacent polishing surface
8 using a first additional object carrier of said additional object carriers;
9 transferring said second object from said additional object transfer
10 station to said second adjacent polishing surface using a second additional object
11 carrier of said additional object carriers.

1 97. The method of claim 96 wherein said sequentially transferring said second
2 object includes displacing at least one of said additional object carriers and at least
3 one of said object carriers together.

1 98. An apparatus for polishing objects, said apparatus comprising:
2 a first object transport device;
3 a second object transport device; and
4 an object polishing unit positioned between said first and second
5 object transport devices, said object polishing unit comprising:
6 at least one polishing surface; and
7 first and second object carriers positioned over said
8 polishing surface to polish said objects on said polishing surface,
9 wherein each of said objects is transferred from said first object
10 transport device to said second object transport device by way of one of said first
11 and second object carriers.

1 99. The apparatus of claim 98 wherein said object polishing unit further
2 comprises first and second polishing surfaces such that said first object carrier can
3 polish some of said objects on said first polishing surface and said second object
4 carrier can polish some of said object on said second polishing surface.

1 100. The apparatus of claim 98 wherein said object polishing unit further
2 comprises an object relay device positioned between said first and second object
3 transport devices, said object relay device including a load-and-unload cup and a
4 pivoting drive mechanism, said pivoting drive mechanism being configured to
5 pivot said load-and-unload cup about a pivoting axis to transfer said objects to or
6 from said first and second object carriers.

1 101. The apparatus of claim 100 wherein said object polishing unit further
2 comprises an additional object relay device positioned between said object relay
3 device and said second object transport device, said additional object relay device
4 including an additional load-and-unload cup and an additional pivoting drive
5 mechanism, said additional pivoting drive mechanism being configured to pivot
6 said additional load-and-unload cup about a second pivoting axis to transfer said
7 objects from said first and second object carriers.

1 102. The apparatus of claim 98 wherein said object polishing unit further
2 comprises first and second object relay devices positioned between said first and
3 second object transport devices, each of said first and second object relay devices
4 including a load-and-unload cup and a pivoting drive mechanism, said pivoting
5 drive mechanism of said first object relay device being configured to pivot said
6 load-and-unload cup of said first object relay device about a first pivoting axis to
7 transfer some of said objects to or from said first object carrier, said pivoting drive
8 mechanism of said second object relay device being configured to pivot said load-
9 and-unload cup of said second object relay device about a second pivoting axis to
10 transfer some of said objects to or from said second object carrier.

1 103. A method for polishing objects, said method comprising:
2 transferring first and second objects to a first end of an object
3 polishing unit using a first object transport device;
4 polishing said first object on at least one polishing surface of said
5 object polishing unit using a first object carrier of said object polishing unit;
6 polishing said second object on said at least one polishing surface
7 using a second object carrier of said object polishing unit; and
8 transferring said first and second object from a second end of said
9 object polishing unit using a second object transport device, said first and second
10 ends being located on opposite ends of said object polishing unit.

1 104. The method of claim 103 wherein said polishing said first object includes
2 polishing said first object on a first polishing surface of said object polishing unit,
3 and wherein said polishing said second object includes polishing said second
4 object on a second polishing surface of said object polishing unit.

1 105. The method of claim 103 further comprising transferring said first and
2 second objects between said first and second object carriers and one of said first
3 and second object transport devices using a load-and-unload cup of said object
4 polishing unit, including pivoting said load-and-unload cup about a pivoting axis.

1 106. The method of claim 105 further comprising transferring said first and
2 second objects between said first and second object carriers and said second object
3 transport device using an additional load-and-unload cup of said object polishing
4 unit, including pivoting said additional load-and-unload cup about a second
5 pivoting axis.

1 107. The method of claim 103 further comprising transferring said first object
2 between said first object carrier and one of said first and second object transport
3 devices using a first load-and-unload cup of said object polishing unit, including
4 pivoting said first load-and-unload cup about a first pivoting axis, and transferring
5 said second object between said second object carrier and one of said first and
6 second object transport devices using a second load-and-unload cup of said object
7 polishing unit, including pivoting said second load-and-unload cup about a second
8 pivoting axis.

1 108. An object relay device for loading and unloading an object, said wafer
2 relay device cup device comprising:
3 a load-and-unload cup;
4 an arm operatively connected to said load-and-unload cup to
5 laterally move said load-and-unload cup; and
6 a cup ascending-and-descending mechanism operatively connected
7 to said load-and-unload cup and said arm, said cup ascending-and-descending
8 mechanism being configured to raise and lower said load-and-unload cup with
9 respect to said arm.

1 109. The object relay device of claim 108 wherein said load-and-unload cup
2 comprises a central bladder connected to a surface of said load-and-unload cup,
3 said central bladder being configured to be inflated and deflated pneumatically in
4 a vertical direction with respect said surface, said central bladder being configured
5 to support said object to raise said object when said central bladder is inflated.

1 110. The object relay device of claim 108 further comprising an air cushioning
2 mechanism operatively coupled to said load-and-unload cup to absorb a vertical
3 action force.

1 111. The object relay device of claim 108 wherein said load-and-unload cup
2 comprises:
3 an object supporting structure;
4 a plurality of bladders coupled to said object supporting structure,
5 each of said bladders being configured to be inflated and deflated pneumatically in
6 a vertical direction with respect to a surface of said object supporting structure;
7 and
8 a plurality of aligners coupled to said plurality of bladders such that
9 at least one bladder is coupled to each aligner, each of said aligners comprising a
10 first horizontal portion to support said object and a second horizontal portion to
11 contact a bottom portion of an object carrier when said bladders are inflated.

1 112. The object relay device of claim 111 wherein said load-and-unload cup
2 further comprises a plurality of second bladders coupled to said object supporting
3 structure and said aligners, each of said second bladders being configured to be
4 inflated and deflated pneumatically in a horizontal direction with respect to said
5 surface of said object supporting structure.

1 113. The load-and-unload cup device of claim 112 wherein each of said
2 aligners further comprises a first vertical portion to move an edge of said object
3 inward when said second bladders are inflated and a second vertical portion to
4 contact an outer surface of said object carrier when said second bladders are
5 inflated.